Precalc Warm Up #6-1

$f(x) = \frac{1}{x}$ $\quad\quad$ $g(x) = 2x - 5$

Find (if it exists) and state the domain and range

1. g(f(x)) 2. f(g(x)) 3. $(f \circ f)x$ 4. $(g \circ g)x$

HW Questions?

In Exercises 1–8, find (a) $(f + g)(x)$, (b) $(f - g)(x)$, (c) $(fg)(x)$, and (d) $(f/g)(x)$. What is the domain of f/g?

5. $f(x) = x^2 + 5$, $g(x) = \sqrt{1 - x}$

In Exercises 9–20, evaluate the indicated function for $f(x) = x^2 + 1$ and $g(x) = x - 4$.

11. $(f - g)(2t)$

15. $\left(\frac{f}{g}\right)(5)$

19. $\left(\frac{f}{g}\right)(-1) - g(3)$

$f - g \rightarrow x^2 + 1 - (x - 4)$

$x^2 - x + 5$

$(f - g)(2t) = (2t)^2 - (2t) + 5$

$= 4t^2 - 2t + 5$

$\frac{f}{g} \rightarrow \frac{x^2 + 1}{x - 4}$

$\frac{(-1)^2 + 1}{-1 - 4} - (3 - 4)$

In Exercises 21–24, find (a) $f \circ g$, (b) $g \circ f$, and (c) $f \circ f$. → $f(f(x))$

$f(g(x))$ $g(f(x))$

23. $f(x) = 3x + 5$, $g(x) = 5 - x$

a) $f(g(x)) = f(5 - x)$

$= 3(5 - x) + 5$ ... then simplify.

23b) $g(f(x)) = g(3x + 5)$

$= 5 - (3x + 5)$

then simplify.

23c) $f(f(x)) = f(3x + 5)$

$= 3(3x + 5) + 5$

then simplify.

In Exercises 25–32, find (a) $f \circ g$ and (b) $g \circ f$.

$f(g(x))$ $g(f(x))$

25. $f(x) = \sqrt{x + 4}$, $g(x) = x^2$

a) $f(g(x)) = f(x^2)$

$= \sqrt{x^2 + 4}$

b) $g(f(x)) = g(\sqrt{x + 4})$

$= (\sqrt{x + 4})^2$

$= x + 4$

29. $f(x) = \sqrt{x}$, $g(x) = \sqrt{x}$

31. $f(x) = |x|$, $g(x) = x + 6$

a) $f(g(x)) = f(x + 6)$

$= |x + 6|$

b) $g(f(x)) = g(|x|)$

$= |x| + 6$

In Exercises 37–44, find two functions f and g such that $(f \circ g)(x) = h(x)$. (There are many correct answers to these exercises.)

37. $h(x) = (2x + 1)^2$

$f(x) = x^2$

$g(x) = 2x + 1$

$f(g(x))$

$2x+1$

$f(x) = x^2$

41. $h(x) = \dfrac{1}{x + 2}$

$f(x) = \dfrac{1}{x}$

$g(x) = x+2$

$f(g(x)) = \dfrac{1}{(x+2)}$

In Exercises 45–48, determine the domain of (a) f, (b) g, and (c) $f \circ g$.

47. $f(x) = \dfrac{3}{x^2 - 1}$, $g(x) = x + 1$

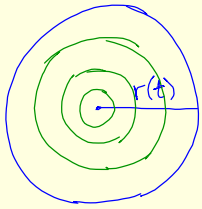
47c was wrong since they asked for $f \circ g$

$f(g(x))$ doesn't exist because

$r_g \nsubseteq d_f$

$\mathbb{R} \nsubseteq x \neq \pm 1$

49. A pebble is dropped into a calm pond, causing ripples in the form of concentric circles. The radius (in feet) of the outer ripple is given by $r(t) = 0.6t$, where t is time in seconds after the pebble strikes the water. The area of the circle is given by the function $A(r) = \pi r^2$. Find and interpret $(A \circ r)(t)$.



$r(t) = 0.6t$

$A(r) = \pi r^2$

$(A \circ r)(t) \Rightarrow A(r(t))$

$A(r(t)) = A(0.6t)$

$= \pi (0.6t)^2$

$= 0.36\pi t^2$

More work with composites

Remember that in f(g(x)), g(x) is applied first.
so g(x) determines the domain.

range of g $\subseteq$ domain of f

otherwise, f(g(x)) doesn't exist

Ex: find f(g(x)) and g(f(x)) and state the dom and range

$f(x) = \sqrt{(x - 1)}$ $\qquad$ $g(x) = 2 - x$

$x - 1 \geq 0$
$x \geq 1$

$d_f = [1, \infty)$
$r_f = [0, \infty)$

$d_g = \mathbb{R}$
$r_g = \mathbb{R}$

$f(g(x))$ exist? $\rightarrow$ $r_g \overset{?}{\subseteq} d_f$
$\mathbb{R} \not\subseteq [1, \infty)$

DNE

$g(f(x))$ exist?
$r_f \overset{?}{\subseteq} d_g$
$[0, \infty) \subseteq \mathbb{R}$ ✓

$g(f(x)) = g(\sqrt{x-1})$
$g(f(x)) = 2 - \sqrt{x-1}$

find ~~f(g(-1))~~

find g(f(10))

$g(f(10)) = 2 - \sqrt{10 - 1}$
$= 2 - \sqrt{9}$
$= 2 - 3$
$= -1$

is this in d_f

Solve the equation $f(g(x)) = 0$

where $f(x) = x + 3$ and $g(x) = x^2 - 7$

$d_f = \mathbb{R}$ $\qquad$ $d_g = \mathbb{R}$
$r_f = \mathbb{R}$ $\qquad$ $r_g = [-7, \infty)$

$f(g(x))$ to exist $\rightarrow$ $r_g \subseteq d_f$
$[-7, \infty) \subseteq \mathbb{R}$ ✓

$f(g(x)) = f(x^2 - 7)$
$= x^2 - 7 + 3$
$f(g(x)) = x^2 - 4$

$x^2 - 4 = 0$
$x^2 = 4$
$x = \pm 2$

Group Event - Wed.

* You can only write on your own paper

* Work together and make sure everyone agrees on what each person is writing on their paper. Check details!

* One paper will be selected at random for grading.

HW: SL book

p. 154 #3 RC, 4c, 5, 7, 9

(#7b is wrong in back)

SL book: Mon - Tues
PC book: Wed - Th

Group Event Wed:
Point Slope
Midpoint
Distance Formula
Write g in terms of f
Describe transformations